MONTHLY WEATHER REVIEW,

MAY, 1876.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In compiling the present Review, the following data have been made use of, viz: The charts constructed from the simultaneous observations taken at eighty-eight Signal Service, U. S. Army, stations, and fourteen Canadian stations, at 7:35 a. m., 4:35 p. m., and 11 p. m., daily, Washington mean time, and telegraphed to this office immediately afterward; monthly meteorological records of observations, taken at 465 stations, including those from the Volunteer Observers, U. S. Naval Hospitals, U. S. Army Post Hospitals, Canadian stations and Signal Service stations; reliable newspaper extracts; special reports from various sections of the country; and Marine Records.

The most noticeable features of the month are: the barometric pressure averages higher than usual in the sections east of the Rocky Mountains; the frequent occurrence of tornadoes, especially those of the 6th in Kansas, Illinois and Indiana; the temperature averages nearly 4° below the normal in the St. Lawrence valley, and 2°.5 above in the Lower Lake region; late frosts in Mississippi and Tennessee; large excess of rain-fall in the Western Gulf States, Tennessee and Upper Mississippi valley; severe snow-storms along Lake Superior, on Pike's Peak, and in Utah, Montana and Wyoming Territories; very few reports of droughts; the destructive thunder and hail-storms; ice-fields in Lake Superior, Straits of Mackinaw, Gulf of St. Lawrence, and near St. Johns, Newfoundland; grasshoppers in Minnesota, Dakota, Wyoming and Montana; aurora of the 25th.

BAROMETRIC PRESSURE.

In General.—Upon chart No. II is represented the general distribution of the atmospheric pressure by the isobaric curves, in black. Of the mean barometric readings received after the printing of the chart, the following are given, viz: Fort Benton, 29.92; Virginia City, 29.66; Pike's Peak, 29.97; Santa Fé, 29.78; Fort Sully, 29.84 inches. (The data on the chart refer to Colorado Springs and not to Pike's Peak.) Along the South Atlantic coast it averages unusually high for the month. Compared with May, 1874, the pressure for May, 1876, averages higher from Lake Superior to the Lower Lakes, in the St. Lawrence valley, New Brunswick, New England, Middle States, Ohio valley, Tennessee, South Atlantic States, Gulf States, (except Texas,) and Oregon; slightly lower from Texas to Colorado, Wyoming, Dakota and the Upper Mississippi valley; about the same in California, Utah and Nova Scotia.

The same, compared with May, 1875, is greater from .01 to .03 of an inch for the Pacific coast, .01 to .05 in the valley of the Red River of the North, .01 to .06 in the Upper Mississippi valley, .01 to .10 in the Missouri valley and Upper Lake region, .03 to .10 in the Lower Lake region, .02 to .07 in the Ohio valley and Tennessee, .01 to .06 in the Gulf States, .06 to .08 in the South Atlantic States, .05 to .09 in the Middle States, .01 to .07 in New England, .10 in Nova Scotia, .02 in New Brunswick and Indian Territory, and .06 to .09 in the St. Lawrence valley; it is .01 of an inch less for stations in Utah and Wyoming; for those in Colorado it varies from .02 of an inch above to .02 below. Some of the greatest barometric ranges, reduced to sea-level, are for Fort Sully, 1.46; Dodge City, 1.37; Eastport, 1.31; Bismarck, 1.30; North Platte, 1.25; Breckenridge, 1.22; Yankton, 1.20; Mt. Washington, 1.15; Omaha, 1.06; Pembina, 1.04; Portland, Me., 1.02 inches. Among the least ranges are for Key West, .34; San Francisco, .38; Augusta, .44; San Diego, St. Marks and Mobile, .45; Lexington, .47; Louisville, Montgomery and New Orleans, .48; Knoxville and Tybee Island, Ga., .49; Charleston and Savannah, .50 inches.

Areas of High Pressure.—These have, generally, first appeared in the northwestern sections, crossed the Lake region and New England, and disappeared to the southeastward or eastward. Reports from the island of Bermuda show that they extend in that direction, and frequently with north or northeast gales. Nos. I, V, VII and VIII presented the most interesting features.

No. I.—At 7:35 a. m., of the 1st, the barometric pressure was highest, (30.30 inches,) over Lake Superior, and the barometric ridge extended thence to Virginia and towards Manitoba. From northern Dakota eastward to the St. Lawrence valley and northern New England, the temperature was below freezing. Frost was reported from Wisconsin and Illinois eastward to Virginia, the Middle States and New England. As low barometer No. II advanced eastward, this high pressure gradually shifted to the rear of it, so that, on the morning of the 2nd, it extended from southeastern Dakota to Indian Territory. The temperature continued below freezing in the northern portions of Minnesota and Dakota, while frosts were occasionally reported from Delaware to New York, and from Arkansas to Missouri, Wisconsin, Michigan, Indiana and Tennessee. By 7:35 a. m., of the 3rd, it was central in northern Louisiana, and frosts occurred from northern Texas, Arkansas, Mississippi and Tennessee to Iowa, the Upper Lake region and Ohio. In advance of low barometers No. III and IV, it moved to the eastward, and was central off the North Carolina coast on the morning of the 4th, producing frost at places in Delaware, New Jersey, Massachusetts and Tennessee. During the 4th it united with No. II, which, on the 3rd, had extended southward over the lower St. Lawrence valley and New England, and on the following morning the highest pressure, (above 30.30,) reached from the Gulf of St. Lawrence to about latitude 35.° N. and longitude 8.° E. At 7:35 a. m., of the 6th, it was central to the southeast of Nova Scotia, with barometric readings of about 30.40 inches along that coast, after which it gradually disappeared to the eastward.

No. III,—appeared during the night of the 3rd in Minnesota, but was of little interest. Frosts were reported on the morning of the 4th from Michigan to Wisconsin and Minnesota.

No. IV,—followed low barometers No. V and VI in the Southwest on the 7th, producing a severe "norther" on the Texas coast during the afternoon and night. On the 8th and 9th it moved south and eastward, and on the morning of the 10th reached from Texas to northern Florida, with frost as far south as northern Mississippi, and with a barometric ridge extending from Louisiana to Minnesota. As low barometer No. VII passed to the eastward, the pressure rapidly increased from the Gulf to lower Michigan. On the morning of the 11th frosts were reported from Delaware, western North Carolina, Ohio and Wisconsin. By 7:35 a. m., of the 12th, it covered the Gulf and South Atlantic States, and then gradually lost its distinctive features.

No. V,—was first observed in Oregon on the 9th, in Montana on the 10th, and in Dakota on the 11th, succeeding low barometer No. VIII. At 7:35 a. m., of the 12th, the ridge of highest pressure extended from Dakota to Iowa, with temperatures near freezing in northwestern Minnesota. As it moved eastward over the Lake region the pressure increased, with barometric readings of 30.36 inches along Lake Superior on the morning of the 13th, and with frosts from Ohio and Indiana to Wisconsin. By 7:35 a. m., of the 14th, it was central over the Virginias, and frosts were reported from Delaware, Pennsylvania and Ohio northeastward to Maine. As low barometer No. IX advanced eastward, this high pressure area developed into two. On the morning of the 15th they were central off the south Atlantic coast and north of Lake Ontario, and frosts occurred from northern New York to Maine. During the 15th and 16th the former continued nearly stationary, and the latter extended south and eastward, with increasing pressure, over the Middle States, New England and eastern British Provinces, producing frosts and frequently ice in New York and New England. At 7:35 a. m., of the 17th, the highest, (above 30.40,) reached from New Jersey beyond Nova Scotia, with frosts in Vermont and Maine. During the 17th and 18th the pressure diminished in the Middle and Eastern States, and slowly in the Southern States.

No. VI,—which was of little interest, made its appearance over Lake Superior during the night of the 17th, passed eastward toward New England and the St. Lawrence valley on the 18th and 19th, and disappeared apparently to the southeastward.

No. VII.—After low barometer No. X began its eastward course, this high pressure area appeared in Dakota and Minnesota on the 21st, and rapidly extended over the Lake region during the 22nd. Along its southeastern front high winds and gales occurred, and frosts in Wisconsin. On the morning of the 23rd the highest barometric reading, (30.43), was reported from Milwaukee, Wis., with frosts as far south as Iowa, Illinois, Indiana, Ohio and Virginia. At 7:35 a. m., of the 24th, a narrow area, enclosed by the isobaric curve 30.30 inches, was traced from southeastern Wisconsin to Pennsylvania, and from latter to northeastern North Carolina, while reports of frosts came from Ohio to Virginia and thence northeastward to New England. During the 24th and 25th it lost its identity by breaking up into several minor areas. On the morning of the 26th frosts were produced from New York to Maine.

No. VIII,—was first observed during the night of the 28th as approaching Manitoba and Lake Superior from the northwestward, and was central north of the latter on the following morning. It delayed the eastward progression of low barometer No. XI, and northeasterly gales were produced over western Lake

Superior. By morning of the 30th, the highest, (above 30.20,) was central north of Lake Ontario, with reports of frosts from New York, Vermont and Massachusetts. Thence it moved southeastward over New England. At 7:35 a. m., of the 31st, the isobaric curve 30.20 inches was traced from New Jersey to Nova Scotia, with the highest pressure lying to the eastward, and with frosts from northern New York and Massachusetts northeastward. During the 31st the pressure continued without change along the New England coast, and increased thence to Florida, but the highest remained central southeast of New England.

Areas of Low Pressure.—A comparison of the charts for the same month in 1873, 1874 and 1875, discloses the following facts, viz: the number of low pressure areas, traced upon accompanying chart No. I, has averaged about the same during the present month; the paths of lowest barometric depression, after they could be definitely located, have generally been, as heretofore, across the northern sections of the country; they have frequently developed into two or more minor depressions; in some cases they could be traced to the north Pacific coast. Broken lines indicate that the paths cannot be accurately drawn on account of the limited number of stations in the Territories, and the impossibility of making use of the barometric readings, taken at the high stations, for drawing isobaric curves, as reduced to the sea-level by the method at present in use. Their average movement, in miles per hour, will be found in a table upon chart No. I.

No. I.—This storm is described in the Review for April as No. XIV. On the 1st instant it continued nearly stationary, and heavy snow fell in New Brunswick and the mouth of the St. Lawrence, accompanied by northeasterly gales, but rain or sleet from Nova Scotia to northern Maine. It disappeared on the 2nd, with northerly winds and cold, clearing weather in those sections. Cautionary Signals were ordered April 30th from Cape Hatteras to Thatcher's Island, Mass., which were justified by high northwest, north or northeast winds. During the morning of the 1st a wind velocity of 48 miles per hour was recorded at Father Point, Canada, and increased to a hurricane from the northwest on Mt. Washington.

No. II.—On the 30th of April this disturbance was felt in Kansas and Indian Territory. During the 1st instant it moved to Mississippi. Thunder-storms occurred from New Mexico and Kansas to Arkansas, Mississippi and Tennessee, with frequently heavy rains, and in Kansas gales. Cautionary Signals had been ordered at Galveston and Indianola, where southeasterly gales, reaching 40 miles per hour at latter, were succeeded on the morning of the 2nd by a severe "norther," attaining 46 miles. During the 2nd thunder-storms, occasionally accompanied by hail, were reported from Louisiana to North Carolina. Cautionary Signals were displayed in the morning along the North Carolina coast, which were succeeded by high northeasterly winds and a heavy sea. During the 3rd and 4th it passed northeastward between Nova Scotia and the island of Bermuda.

No. III,—apparently advanced southeastward over eastern Montana on the 2nd to southern Dakota, accompanied by a severe SE. gale at Fort Sully, which, at 8 p. m., reached 60 miles per hour, and on the 3rd by a heavy snow-storm over Lake Superior. As it passed to the eastward, generally light rains fell in the Lower Lake region, New York and New England. The main disturbance crossed Lake Huron into Canada, while a secondary depression was developed along the Lower Lakes and disappeared in New England. Cautionary Signals were ordered on the morning of the 3rd at Marquette, Escanaba, Milwaukee, Grand Haven and Alpena, and on the following morning from Cleveland to Oswego, and were justified by dangerous winds at, or in the vicinity of, the stations.

No. IV,—probably developed during the 2nd and 3rd from No. III, and passed southward over Colorado towards northern Texas, under the influence of high pressure No. III. Generally light rains and snow fell from Montana to Utah and Colorado. During the 4th, brisk and high southerly winds were reported from the Texas coast, with threatening or rainy weather, frequent thunder-storms and occasional hail thence northeastward to Indiana, Illinois, Iowa and Nebraska. On the 5th, it moved quite rapidly to Lake Huron, with threatening and rainy weather extending over the Lake region and New England. Thunder-storms were occasionally reported from Texas, Louisiana, Mississippi and Alabama to Ohio. Like the previous disturbance, it sent a minor depression eastward over New England and Nova Scotia. Cautionary Signals were ordered at midnight of the 4th and morning of the 5th from Lake Michigan to Lake Ontario. Dangerous winds were reported as having occurred at Milwaukee and Rochester only.

No. V.—The southern edge of this storm was felt in Oregon, where light rains fell on the 3rd and 4th. As it passed southeastward over Montana, Nevada, Utah, Wyoming and Colorado towards Indian Territory, light rains or snow accompanied it, which continued until the 6th. Upon the last date, it moved almost due northward. Threatening and rainy weather reached east and southward to Nebraska, southern Minnesota, Upper Lake region, Ohio valley and West Gulf States, with frequent and severe thunder-storms. Tornadoes are reported to have occurred at a number of places, viz: at Leavenworth, Kan., 6th, 3:15 a. m., (local time,) severe whirlwind passed over city from the southwest, destroying three buildings and unroofing ten others; from 10 p. m., of the 5th, up to time of whirlwind, a terrific thunder-storm raged, attended by very heavy and incessant rain. In Indiana, on the 6th, about 5 p. m., (local time,) a tornado passed through the southern part of Hamilton county. It formed at White river, about two miles from the north line of Marion

county, moved 20° north of east, passed through Delaware, Fall Creek and Wayne townships in Hamilton, and stopped in Strong Creek township, Madison county. It traveled about twenty miles, and was about one hour in passing that distance. Farm houses, barns, &c., were destroyed. Cattle, sheep and timber were taken up and whirled through the pipe. Its shape was that of an hour-glass, which, at times, would separate, and its color dark black. Chicago, 6th, 5:10 p. m., (local time,) was visited by a tornado, accompanied by rain, thunder and lightning, from southwest to northeast, having a swift rotary motion from right to left, bounding along like a ball; apparently reached the ground but two or three times; was last seen near the "crib," at which point it demolished the fog-bell tower; estimated that about a quarter of a million dollars damage was done to property in and about the city. Carbondale, Ill., 6th, at 9:30 p. m., (local time,) a tornado struck the city on the northwest, and passed through to the southeast; trees were uprooted, houses unroofed, and the Illinois Central Railroad depot demolished. A few miles to the north a locomotive and train of cars, (on the Illinois Central Railroad,) were blown from the track near Neoga, Cumberland county. It was accompanied with vivid lightning, and storm terminated at 11 p. m. Anna, Ill., 6th, at 9:30 p. m., (local time,) during a heavy thunder and rain storm, a tornado, covering a track about five hundred yards wide, and lasting about five minutes, passed near the town toward the northeast, uprooting and breaking off trees twelve and fifteen inches in diameter, and damaging buildings. At 11 p. m., the isobaric curve 29.40 inches was central in the southwestern corner of Iowa, with barometric troughs extending thence towards Ohio and Arkansas, where the conditions were favorable for the formation of tornadoes and severe local storms. In the morning signals had been displayed at Chicago, Milwaukee and Grand Haven, and in the evening and night at the remaining stations along the Lakes. Nearly all were justified by dangerous winds succeeding. At Buffalo and Evanston, Ill., the highest wind-velocity, 36 miles per hour, was recorded. During the 7th the isobaric curves separated quite rapidly, or, in other words, the barometric gradients became less steep, and the disturbance lost very much of its force. By midnight isobar 29.70 included nearly the whole of the Upper Lake region, while minor depressions had developed, and were central over Lake Champlain and southeast of Maine. Thunder-storms, with occasional hail, occurred from Tennessee to Kansas, the Lake region and New England. Upon the 8th it passed into Canada, but sent over the Lower Lakes and St. Lawrence valley another secondary depression. Brisk to high westerly winds followed it over Lakes Huron and Erie, and a southwest gale off Cape Hatteras. Thunder-storms continued from North Carolina to Ohio, New York and Connecticut. On the 9th Cautionary Signals were ordered from North Carolina to Massachusetts, but only those along the coast of the former were verified. At Smithville, N. C., an hourly wind-velocity of 47 miles from the southwest was recorded, and at Cape Lookout 41 from the south.

No. VI,—may be considered as a branch of the previous one. During the night of the 6th, 7th and 8th, as they progressed eastward, a barometric trough connected them. Severe thunder and heavy rain storms resulted in the Gulf States. As the wind shifted to the north it increased to gales at many places, reaching 48 miles per hour at Indianola, 35 at Galveston and Mobile, and 28 at New Orleans. On the 9th it crossed Florida, with thunder-storms thence to Virginia. At Key West the anemometer registered 48 miles per hour from the southwest at 8:20 p. m.

No. VII,—advanced southeastward over Manitoba on the 8th. During the 9th light rains fell in the Lake region, with thunder-storms in Illinois and Indiana. At 4:35 p. m. a narrow area, enclosed by isobar 29.60, extended along the western shore of Lake Michigan. In connection with minor depressions left by the two previous low barometers, it produced thunder-storms from Indiana to South Carolina and eastward to New England, with occasional hail in Pennsylvania and Delaware, on the 10th. After the winds had shifted to westerly along the New Jersey coast they increased in force, reaching 36 miles per hour at Cape May, 52 at Long Branch, and 70 at Sandy Hook. During the 11th it passed northeastward to the Gulf of St. Lawrence, accompanied by rainy weather in New England and thunder-storms in Maine. On Mt. Washington the wind blew a northwest gale, 36 miles per hour at Newport, 40 at Boston, and 41 at Thatcher's Island, from the west.

No. VIII.—During the 10th cloudy and rainy weather prevailed in Montana, but the central depression passed to the northward. By 11 p. m. it had reached southeastern Dakota, and was enclosed by isobar 29.60 inches. In Dakota and Minnesota severe thunder-storms occurred. During the 11th the northern portion progressed eastward more rapidly than the southern, due to high pressure No. V advancing southeastward in its rear, so that, by 11 p. m., it was central near the southern end of Lake Michigan, with a barometric trough extending southwestward over Indian Territory. Thunder-storms were reported from Colorado to Minnesota, Michigan and Indiana. Cautionary Signals were displayed on the 10th at Duluth, and on the 11th at the remaining stations along the Lakes, the majority of which were justified. At Milwaukee and Grand Haven the northeast wind reached 28 miles per hour, and at Cleveland, N. W., 43. As shown upon chart No. I, it divided into two on the 12th, one disappearing southeastward over Virginia, the other moving to Maine. Thunder-storms were frequent and severe, accompanied by occasional hail, from North Carolina, Kentucky and Indiana northeastward to New England. Cautionary signals were ordered from North Carolina to Maine, but the majority was reported as not justified. At Kittyhawk, N. C., 36 miles of

wind from the S. W. were recorded, and at Vineland, N. J., 40. During the 13th, the northern branch passed eastward beyond the stations, with thunder-storms in Maine.

No. IX,—succeeded high pressure No. V. During the 13th the barometer continued falling from Montana southeastward to the Upper Mississippi valley, with thunder-storms. On Pike's Peak a severe snow-storm prevailed, and several hundred miles east of Dodge City, a tornado, accompanied by unusually heavy heavy rains. At Fort Sully the south wind reached 37, and at Breckenridge, SE., 45 miles per hour. On the 14th the storm centre advanced into southern Dakota, with severe thunder-storms as far southward as New Mexico and northern Missouri. At Duluth a severe northeast gale prevailed; at Dodge City, SE., 42, Fort Sully, N., 40, and at St. Paul, SE., 44 miles per hour were registered. By 4:35 p. m., of the 15th, an area, enclosed by isobaric curve 29.40, was central in southeastern Dakota, with barometric troughs extending southward toward Indian Territory and eastward over Ohio to the New Jersey coast. Frequent and severe thunder-storms prevailed during the day from Dakota and the Lakes southward to Indian Territory, Kentucky and North Carolina, with occasional hail. The highest hourly wind-velocities recorded were at Toledo, E., 35, Alpena, E., 30, and Milwaukee, SE., 35 miles. A violent northwest gale, lasting about eight minutes, swept over the vicinity of Fallston, Md., at 7:05 p. m., overturning buildings, prostrating the largest forest trees, &c. On the 16th it diminished very much in force. High northeast winds were reported from the New Jersey coast and Duluth; frequent and, at places, destructive thunder-storms from Dakota, Iowa and Kansas eastward to the Middle States. During the 17th it passed into Canada. Occasional thunder-storms occurred from North Carolina to Ohio, Michigan and New York; at Cleveland a southwest wind of 42 miles. On the 18th the central depression passed eastward near the mouth of the St. Lawrence, producing thunder-storms from North Carolina to New York and New England. Cautionary Signals were displayed on the 13th along Lakes Superior and Michigan, on the 14th along Lakes Huron and Erie, and on the 15th along Lake Ontario and the New Jersey and North Carolina coasts, all of which were justified except those along LakeOntario and the North Carolina coast.

No. X.—After low barometer No. IX moved eastward over the Northwest, the pressure continued quite low at the stations in Montana. Generally light rains fell on the 16th and 17th from Oregon to Utah and Montana, partly turning into snow. Upon the latter date the central depression passed over Montana and Wyoming, with rapidly falling barometer west of the Upper Mississippi valley. Thunder-storms were occasionally reported from Utah and Dakota, and 18 inches of snow from Camp Douglass, Utah. During the 18th it advanced to Dakota and Nebraska, accompanied by rain or snow from Montana and Idaho eastward to Minnesota. Frequent thunder-storms occurred from that section south and eastward to northern Texas, Missouri, Tennessee, Ohio and Wisconsin. At Dodge City, an hourly wind-velocity of 36 miles from the east, and at Breckenridge and Davenport, SE., 35 miles were registered. A A water-spout was observed seven miles northwest of Dubuque. At Fort Benton, nearly 5 inches of rain fell on the 17th and 18th. At 7:35 a. m., of the 19th, an area, enclosed by isobaric curve 29.50, covered the eastern portion of Dakota, and a barometric trough extended thence to Ohio. Thunder-storms were frequently reported from Dakota south and eastward to Kansas, Iowa, Illinois, Indiana, Virginias and western Pennsylvania, with hail in first and last sections. During the 20th it continued nearly stationary in northeastern Dakota, but with falling barometer in the Lake region. Destructive hail-storms were reported from Yankton, and Cedar county, Neb., and frequent thunder-storms from Dakota south and eastward to northern Texas, Illinois, Michigan and western Pennsylvania. Southerly winds reached at St. Paul 38 and at Denison 60 miles per hour. At 11:50 a. m. a heavy gale of wind or tornado, accompanied with hail one inch in diameter, passed below Yankton, crossed the Missouri river into Nebraska, then curving crossed its former track near Gayville, fourteen miles below Yankton, at noon, and at 3 p. m had reached Worthington, Minn. Considerable damage was done to buildings and crops. During the 21st it crossed the Upper Lake region quite rapidly, and was followed by high pressure No. VII. Frequent and severe thunder storms, with hail in many places, resulted from Wisconsin to northern Texas and eastward to the Atlantic States. Some of the highest hourly wind-velocities are: for Port Huron, N., 30, Toledo, SW., 27, Indianola, S., 36, Sandy Hook, NW., 40, and Cape May, NW., 44 miles. At 4:35 p. m., of the 22nd, the pressure was lowest over New Brunswick and the New England coast, with a barometric trough extending southwestward towards Florida, and rapidly increasing pressure in the Lake region. In the Middle States, New England and North Carolina, frequent and severe thunder-storms occurred, with occasional hail, and a tornado at Rondout, N. Y. Some of the highest wind-velocities reported are for Milwauke, NE., 34, Port Huron, N., 48, Oswego, N., 36, Sandy Hook, N., 40, Long Branch, NW., 48 miles per hour, and on Mt. Washington a gale. On the 23rd it disappeared eastward over Nova Scotia, followed by clearing weather in the Atlantic States. Cautionary Signals were displayed on the 18th at Duluth, and 19th at Escanaba and Marquette, but not justified; on the 22nd, along the Lower Lakes and Atlantic coast from Georgia to Maine, the majority of which were succeeded by dangerous winds. This disturbance left a secondary depression, which, on the 22nd, in connection with low pressure No. VII, caused thunder-storms from Nebraska and Colorado to Indian Territory, with occasional hail. On Pike's Peak a severe snow-storm prevailed. At Dodge City, a northeast wind of 51 and Denver 40 miles per hour were recorded. During the 22nd and 23rd, 6.70 inches of rain fell at

Denver. Thunder-storms continued on the 23rd from Nebraska to Mississippi, Louisiana and northern Texas, and on the 24th, 25th, 26th and 27th from Texas to Alabama.

No. XI.—On the 28th, falling barometer in the Upper Missouri valley indicated the approach of this storm, and very light rains were reported from Utah to Nebraska, with a hail-storm below Fort Randall, D. T. At 7:35 a. m., of the 29th, it was probably central over the eastern portions of Wyoming and Montana, with a barometric trough extending eastward over the Lake region. Frequent thunder-storms were reported during the day from Dakota and Montana south and eastward to Texas, Alabama, Illinois and Michigan, with hail in Nebraska, Montana, Dakota, Iowa and Michigan. At Detroit, Mich., severe thunder storm at 2:45 p. m.; during morning barometer fell steadily; 2 p. m., temperature 82° Fahrenheit, and heat overpowering, notwithstanding a steady west wind of 12 miles per hour; 2:45 p. m., wind suddenly veered from west to north, and in a few moments to northeast, increasing to 20 miles per hour; rain in torrents, flooding streets and basements, and washing away pavements, trees, curbing, &c.; 3:30 p. m., during a period of five minutes, the wind blew at the rate of 35 miles per hour, and some hail fell at the same time. The following hourly wind-velocities were reported: At Duluth, NE., 36, Breckenridge, SE., 29, and Toledo, NE., 42 miles. During the 30th the pressure continued diminishing over the Northwest and Lakes, and, at 11 p. m., an area, enclosed by isobaric curve 29.00 inches, was central in Dakota. Thunder-storms were occasionally reported from thence to Michigan and the Gulf States, with snow and hail in Montana and Utah. The following are some of the highest hourly wind-velocities: Indianola, S., 30, North Platte, SE., 40, Dodge City, E., 43, and Pike's Peak, W., 76 miles. On the 31st the central depression advanced to eastern Dakota, with a barometric trough extending southward over Indian Territory. Frequent and severe thunder-storms prevailed from Dakota, Minnesota and the Upper Lakes to the Gulf States, with hail in Wyoming. At St. Louis, S., 34, Breckenridge, SE., 41, and North Platte, 42 miles per hour were recorded. Cautionary Signals were ordered on the 29th at Duluth, Milwaukee, Chicago and Grand Haven, on the 30th, at Escanaba and Marquette, and on the 31st, as far east as Buffalo, the majority of which were justified. As this storm moved to the eastward it diminished very much in force.

TEMPERATURE OF THE AIR.

The isothermal curves, (in red,) upon chart No. II, illustrate the general distribution of the temperature of the air for the month. Mean temperatures received late and not given on the Chart are: for Fort Benton, 57°; Virginia City, 46.°4; Pikes Peak, 21.°4; Fort Sully, 61.°7; North Platte, 59.°6; Santa Fé, 55.°9; Mt. Washington, 33.°1. By referring to the table in the lower left-hand corner of the same chart, it will be seen that the average is below that for many years in New England, the South Atlantic States, along the Pacific coast, and in the St. Lawrence valley; nearly the same in the Middle Atlantic States, Gulf States and Upper Mississippi valley; above in the Lake region, Ohio valley, Tennessee and Missouri valley. Minimum and maximum temperatures, respectively, for the month, are given for the following stations, viz: Portland, Or., 36°, 82°; San Francisco, 45°, 81°; San Diego, 50°, 76°; Salt Lake City, 33°, 88°; Cheyenne, 27°, 81°; Denver, 32°, 85°; Pike's Peak, 2°, 39°; Santa Fé, 28°, 78°; Virginia City, 24°, 81°; Bismarck, 23°, 87°; Pembina, 22°, 57°; Fort Sully, 27°, 96°; St. Paul, 31°, 89°; Leavenworth, 37°, 87°; Duluth, 26°, 87; Marquette, 23°, 86°; Chicago, 35°, 87°; Detroit, 30°, 85°; Oswego, 31°, 91°; Pittsburgh, 27°, 91°; Memphis, 48°, 88°; New Orleans, 57°, 86°; Indianola, 58°, 87°; Eagle Pass, Texas, 72°, 102°; Key West, 70°, 91°; Savannah, 50°, 94°; Norfolk, 38°, 89°; Knoxville, 40°, 89°; Washington, 34°, 90°; New York, 34°, 83°; Boston, 34°, 86°; Eastport, 33°, 65°; Mt. Washington, 7°, 55°.

Ranges in Temperature.—The greatest ranges, from 61° to 69° Fahrenheit, are reported from western Pennsylvania to Minnesota and Dakota; the least ranges, 21° to 30°, from southern Florida to Texas, 26° at San Diego, and 32° at Eastport and Wood's Hole.

Frosts and ice, destructive to fruits and early vegetables, are reported as follows, viz: on the 1st, ice formed ¼ inch thick at Elmira, Ill., Atco, N. J., and West Chester, Pa.; at Ringgold, O., cherry, plum and apple trees, and at Morgantown, cherry, peach and plum trees, were injured by freezing; 2nd, 6th and 19th, at Santa Fé, tender vegetables damaged; 3rd, at La Grange, Tenn., (latest frost known,) fruit all killed, except cherries and grapes, at Corsicana, vegetation slightly damaged, and at Muscatine, Iowa, sweet potatoes and tomatoes killed; 15th, ice formed at Salt Lake City; 16th, asparagus frozen at Gardiner, Me.; 16th and 17th, at San Jose, Cal., grapes injured; 17th, a frost damaging vegetation at Carson City, Nev., and at New London, iced formed ⅜ inch thick; 18th, at Kanab, Utah, peaches, apples, grapes, &c., killed—ice ¼ inch thick; 21st, potato vines killed at Viejas, Cal.; 23rd, Malone, N. Y., vegetables killed; 31st, squash vines killed at Plaistow, N. H. At Fayette, Miss., first May frosts for years on 3rd and 9th.

PRECIPITATION.

Upon chart No. III is represented the distribution of rain-fall and melted snow. The following figures were received after the printing of the chart, viz: Virginia City, 5.58; Pike's Peak, 4.73; Santa Fé, 0.83;